

# CLIMATE CHANGE ON THE BASIS OF THE PARIS CLIMATE AGREEMENT AND ITS EFFECTS ON DEVELOPING COUNTRY ECONOMIES

Gülşah ÖZDEMİR<sup>1</sup>

Sevgi SEZER<sup>2</sup>

## 1. INTRODUCTION

Economic growth rates have increased in the World countries since the early 20th century. The increasing growth rates of countries' economies worldwide have also increased the need for energy and raw materials. However, governments have made severe mistakes in meeting their energy and raw material needs. As a result of the mistakes made, nature was unconsciously destroyed. This process was accompanied by rapid population growth, and many environmental problems, especially water and air pollution, emerged. Environmental issues initially spread nationally and then regionally. Nowadays, with the introduction of technology into production processes in the following years, environmental problems have reached global dimensions like a snowball. Environmental problems have reached even more severe levels, especially after the 1970s, with the thinning and depletion of the ozone layer, increased acid rain, and the destruction of tropical forests. Subsequent studies have shown that industrialization processes significantly affect the environment and raise environmental problems. At this point, the effects of climate change have reached a level that threatens not only the country and region but also the humanity of the whole World. This shows how important this issue has become and reveals the necessity of serious policy recommendations and implementation by conducting academic studies at this level. "Global climate change" is now one of the environmental problems that humanity has ever faced, perhaps the most significant and severe crisis. With industrialization, which started after the Industrial Revolution and brought about intense carbon production, greenhouse gas accumulations have occurred in the atmosphere, and the adverse effects have reached an irreversible level due to the destruction of natural vegetation that absorbs greenhouse gases. Thus, we have entered a process in which human-induced factors intervene in the natural change of the climate, which has a dynamic structure. On the other hand, it should not be forgotten that the environment has a system that has a slow development process over many years but can change naturally. In other words, the fact that the climate changes spontaneously and that humans do not influence this process represents climate variability. In this sense, it is essential to distinguish the concepts of climate variability and climate change. Climate change includes both the natural variability of the climate observed in specific periods and the changing atmospheric composition through

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<sup>1</sup> Asist. Prof. Dr., Balıkesir University, Burhaniye Faculty of Applied Sciences, Department of International Trade Burhaniye/BALIKESİR, gulsah.ozdemir@balikesir.edu.tr, ORCID: 0000-0001-8900-2560.

<sup>2</sup> Assoc. Prof. Dr., Balıkesir University, Burhaniye Faculty of Applied Sciences, Department of Finance and Banking, Burhaniye/BALIKESİR, sevgi.sezer@balikesir.edu.tr, ORCID: 0000-0001-6958-3329.

indirect and direct human activities and intervention. The Intergovernmental Panel on Climate Change, held in 2010, emphasized that human activities cause climate change. Therefore, there needs to be more conceptual clarity on the subject, and more clarifying studies are seriously needed. Today, studies show that climate change has completely changed and disrupted the ecological system of the environment due to human activities. Interest in these studies is increasing day by day. The main event in climate change is the consumption of fossil fuels and its increase, causing the greenhouse effect. Climate change severely threatens plants, animals, people, all living things, countries, national economies, and the whole World. As a result of these developments, interest in the subject has gradually increased in scientific and political circles in recent years. Efforts to reveal the current and possible effects of climate change have increased in studies. Sectors such as agriculture, tourism, and energy are significantly affected. In addition, countries' labor productivity, employment, and economic growth, especially in these sectors, are negatively affected. Climate change profoundly affects people's lives around the World. Taking precautions against climate change and adapting to this change will only be possible by transitioning to a sustainable and low-carbon economy. In this situation, significant economic investments and coordinated actions become increasingly necessary. The Paris Climate Agreement appears as one of these cooperation initiatives. As a matter of fact, considering that the global economy continues to be primarily dependent on oil, gas, and coal, it seems that countries have made adhering to the Paris Agreement more than a matter of choice by reducing annual greenhouse gas emissions and following a long-term path to complete decarbonization. This study aims to determine the reflections of greenhouse gas emissions between 2010 and 2020, reported explicitly for developing countries, on the agriculture, tourism, and energy sectors in these countries' economies and to make evaluations for the next ten years. In this study to be carried out, many purposes are pursued, such as revealing the current and possible negativities in the sectors most affected by climate change, examining labor productivity and employment in these sectors, and revealing the impact of all these developments on the country's economic growth. As a result of this study, the effects of recent natural disasters such as floods, tsunamis, and hurricanes that have occurred within the framework of the climate crisis, especially on the economies of developing countries, will be presented as examples. While the negativities of the climate crisis are discussed from a global perspective, it will be possible to examine the issue for developing countries in particular. As a result of revealing the current situation, suggestions can be made to policymakers for possible future impacts. The magnitude of the global crisis induced by climate change has been the focus of numerous academic, political, and societal discussions in recent decades. As overwhelming evidence demonstrates that anthropogenic activities are primarily responsible for this pressing issue, the urgent need for international cooperation and decisive action cannot be overemphasized (IPCC, 2014).

The Earth's climate system is essentially dynamic, varying throughout various periods. However, the rapid environmental changes observed over the last century, including an unprecedented rise in global temperatures, sea-level rise, and the frequency of extreme weather events, have been significantly influenced by human interventions, particularly the combustion of fossil fuels (Masson-Delmotte et al., 2018). Climate change is more than just an environmental concern; it has far-reaching socioeconomic, political, and cultural implications.

The growing consequences jeopardize biodiversity (Urban, 2015), disrupt food production systems (Porter et al., 2014), put water resources under strain (Döll et al., 2015), and exacerbate public health issues (Watts et al., 2015). Such cascading impacts highlight the vulnerability of global economic and societal frameworks, underlining the importance of prompt and effective intervention. Recognizing the rising problems faced by climate change, 196 nations came together in 2015 to adopt the Paris Climate Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) framework. This historic deal intends to keep global warming far below 2 degrees Celsius over pre-industrial levels, with a goal of 1.5 degrees Celsius (Rogelj et al., 2018). Unlike its predecessor, the Kyoto Protocol, which was criticized for lacking inclusion and efficacy (Grubb, 2004), the Paris Agreement is built from the ground up, with states determining their contributions based on national conditions. As expressed in the NDCs, this decentralized structure emphasizes the commitment to joint accountability and diverse talents (Hale, 2016). Developing nations, generally with limited resources and adaptive capacity, are caught between the effects of climate change and economic objectives. Industrialized countries have historically contributed considerably to global carbon emissions while receiving the socioeconomic benefits of fossil fuel-based economies (Shue, 2014).

In contrast, poor countries have the combined task of promoting economic growth and mitigating/adapting to climate change while working with sometimes limited resources and skills (Agrawal & Perrin, 2009). Given this context, the climate conversation must reflect these countries' specific vulnerabilities and problems. Furthermore, achieving global climate targets implies that emerging countries, which collectively house a significant percentage of the global population and are critical to future emissions trajectories (Tubiello et al., 2014), begin on sustainable development routes. Awareness of their difficulties, opportunities, and ambitions is critical to developing equitable, practical, and successful climate solutions.

## **2. HISTORICAL BACKGROUND**

### **2.1.A Brief History of International Climate Negotiations**

Until the early 1970s, climate change was seen as a topic ripe for academic-based discussion and debate. In 1972, governments worldwide acknowledged for the first time that industrialization and technology had become a severe environmental threat. The Stockholm Summit brought the environment to the global and 'political' agenda for the first time. Essentially, many developing countries believed that the 'environment' was for the rich, while their immediate concern was tackling their own domestic problem of poverty.

As an internationally acknowledged subject, climate change dates back to the late twentieth century. Scientists began to see distinct patterns of atmospheric change in the early 1900s, with Arrhenius' pioneering study anticipating the greenhouse effect of excessive CO<sub>2</sub> (Arrhenius, 1896).

However, it was not until the late 1980s and early 1990s that the international community began to consider the matter. In the 1980s, especially with the discovery that CFCs were rapidly depleting the ozone layer, many countries tried to solve the problem. The Montreal Protocol was thus signed in 1987 and declared that HCFC should be fully phased out by 2030.

The Montreal Protocol came into force in 1989, and within seven years, the use of the most dangerous substances was more or less eliminated. Every member of the United Nations has ratified the agreement. In 1992, the Earth Summit was held in Rio de Janeiro, where the main goal was to stabilize greenhouse gas concentrations and return the emissions of developed countries to 1990 levels. The Rio Earth Summit in 1992 was a landmark moment. This meeting resulted in the creation of the United Nations Framework Convention on Climate Change (UNFCCC), which provided a worldwide framework for tackling climate change for the first time (Bodansky, 2001). The critical achievement here was the signing of the UNFCCC, under which governments agreed to collect and share information on greenhouse gas emissions and, importantly, provide technological and financial support to developing countries. Nations agreed to keep greenhouse gas concentrations stable at a level that would preclude harmful anthropogenic influence on the climate system.

## **2.2.The Emergence and Objectives of the Paris Climate Agreement**

In the years afterward, despite many Conferences of Parties (COP) meetings under the UNFCCC, a globally enforceable agreement has remained elusive. The 2009 COP15 in Copenhagen was considered a severe defeat since world leaders could not agree on effective action (Karlsson et al., 2011). Against this context, the 2015 COP21 in Paris stood out as a beacon of hope. After years of discussions, the Paris Climate Agreement was approved on December 12, 2015. The agreement aims to keep global warming well below 2 degrees Celsius over pre-industrial levels, with a goal of 1.5 degrees Celsius. By embracing a decentralized framework, the Paris Agreement represented a paradigm change, with nations freely setting Nationally Determined Contributions (NDCs) to accomplish the shared objective (Iacobuta et al., 2018).

The Paris Agreement is one of many agreements signed over the last 40 years and is an effort to undo the collective damage caused by the overuse and greed of natural resources in our quest for 'development'. The Paris Agreement is important because climate change is a threat to the environment and all humanity. Global warming threatens global weather patterns and can exacerbate natural disasters. Climate change endangers human health. Global warming can only be mitigated through collective global action. (Falkner, 2016)

## **2.3.Key Differences from Prior Agreements (e.g., Kyoto Protocol)**

According to the Paris Agreement, to minimize the adverse effects of climate change, developed countries should primarily provide financing, technology transfer and capacity-building opportunities to improve the adaptation and resilience capabilities of other underdeveloped and developing countries. At the point of emission reduction, the Agreement imposes absolute emission reduction responsibility on developed countries, while it imposes a gradual reduction target on developing countries over time under their national economic conditions.

Unlike the Kyoto Protocol, the fact that developed and developing countries participate in the Agreement with declarations of good faith (Intended Nationally Determined Contribution/INDC) shows that it has a structure that considers the countries' development levels and collective responsibilities.

The Kyoto Protocol, signed in 1997, was one of the most prominent precursor accords to the Paris Climate Agreement. While both accords were pioneering in their own way, they have significant differences:

*Binding Targets vs. Voluntary Contributions:* The Kyoto Protocol established legally binding targets for industrialized countries to reduce emissions. The Paris Agreement, on the other hand, is based on voluntary contributions established by the nations themselves in their NDCs (Oberthür & Ott, 1999; Victor, 2011).

*Differentiation:* The Kyoto Protocol created a clear divide between industrialized and developing countries, with the former having mandated objectives and the latter not. The Paris Agreement acknowledges the idea of ‘shared but differentiated responsibilities,’ suggesting that while all nations have a role, the level of action differs according to their capacities and past contributions (Rajamani, 2016).

*Adaptation and Finance:* Recognizing climate consequences are already occurring, the Paris Agreement focuses more on adaptation. It also establishes a more explicit structure for climate financing, with wealthier countries agreeing to generate \$100 billion annually to assist developing countries by 2020 (Höhne et al., 2017).

*Review Mechanism:* While both accords feature a review process, the Paris Agreement includes a global stocktake every five years to analyze collective progress and raise aspirations (Van Asselt, 2016). In essence, the historical trajectory of climate discussions, culminating in the Paris Climate Agreement, illustrates the global community’s rising recognition of the seriousness of climate change. While previous agreements, such as the Kyoto Protocol, lay the groundwork, the Paris Agreement represents a more inclusive, flexible, and ambitious strategy, which is critical for navigating the problems of the twenty-first century.

### **3. CORE ELEMENTS OF THE PARIS CLIMATE AGREEMENT**

The Paris Climate Agreement, a watershed moment in international climate diplomacy, was agreed on December 12, 2015, during the United Nations Framework Convention on Climate Change (UNFCCC) 21st Conference of the Parties (COP21). This historic agreement consolidated common objectives, outlining five essential factors critical to its effective execution and the larger fight against climate change.

#### **3.1. The Goal to Limit Global Temperature Rise**

One of the critical goals of the Paris Agreement is to keep the global average temperature rise well below 2°C over pre-industrial levels, with attempts to keep it under 1.5°C (Schleussner et al., 2016). This lofty goal is based on scientific evidence that exceeding the 2°C barrier will significantly exacerbate the adverse effects of climate change, ranging from sea-level rise to extreme weather events (Rogelj et al., 2018). The more ambitious 1.5°C target resulted from pressure from vulnerable countries such as small island developing states (SIDS), which face existential dangers even with a little temperature increase (Robinson & Shine, 2018). Achieving this goal would need fast decarbonization of the global economy and unparalleled collaboration and innovation.

### **3.2. Nationally Determined Contributions (NDCs)**

NDCs are the core of the Paris Agreement, encapsulating nations' promises to cut national emissions and adapt to the consequences of climate change. Unlike earlier accords that mandated top-down requirements, NDCs let nations set their own objectives based on their own capacities, national conditions, and developmental priorities (Hsu et al., 2020). Every five years, every party must communicate its NDCs, ensuring that they represent a development and the highest level of ambition achievable. The adaptability of NDCs accommodates nations' diverse capacities while supporting a shared responsibility paradigm (Pauw et al., 2019).

### **3.3. Transparency, Global Stocktake, and Ratcheting Mechanism**

The Paris Agreement lays a significant focus on openness in order to foster mutual trust and confidence and efficient implementation. To monitor and report on parties' emissions and efforts to achieve NDCs, an Enhanced Transparency Framework (ETF) was created (Dagnet et al., 2017). The global stocktake, which begins in 2023 and repeats every five years, is central to the accord's adaptive design. It evaluates collective progress toward the agreement's long-term goals, considering mitigation, adaptation, and financial flow (Hegglin et al., 2022). The ratcheting mechanism guarantees that parties' following NDCs are more ambitious than their previous ones, aligning closer to the 1.5°C or 2°C pathways (Rajamani & Brunnée, 2017).

### **3.4. Financial Commitments, Technology Transfer, and Capacity-building**

Recognizing that poor nations require significant resources to green their economic paths and adapt to climate change, the Paris Agreement reiterates developed countries' commitment to mobilize \$100 billion annually until 2025, with a new objective to be defined post-2025. In addition, the Agreement emphasizes the significance of technological development and transfer. The Technology Mechanism, which was formed in 2010, was enhanced to encourage technical innovation and distribution, which are critical for mitigation and adaptation methods (De Coninck & Sagar, 2015). Another critical component is capacity development. The Paris Agreement established the Paris Committee on Capacity-building to strengthen poor nations' capabilities and ensure the Agreement is adequately implemented (Dagnet et al., 2021).

### **3.5. Loss and Damage Recognition**

Article 8 of the Paris Agreement legally defines "loss and damage" as a different pillar from mitigation and adaptation, emphasizing the need to tackle climate change's irreversible effects. While it does not establish culpability or compensation processes, it does institutionalize the Warsaw International Mechanism for Loss and Damage by providing a platform for support, such as financing, technology, and capacity-building (Vanhala & Hestbaek, 2016). In conclusion, the Paris Climate Agreement, through its key features, provides a comprehensive framework for addressing climate change. The Agreement symbolizes the global community's renewed determination to protect our planet for future generations by combining rigorous scientific objectives with flexible national pledges, fostering transparency, and stressing solidarity via financial and technical assistance.

## **4. IMPACT OF CLIMATE CHANGE ON DEVELOPING COUNTRIES**

Climate change is more than simply an environmental issue; it has far-reaching socioeconomic consequences and highly inequitable effects. Despite contributing the least to global emissions, developing nations generally face the brunt of climate change owing to a combination of geographical, economic, and infrastructure vulnerabilities.

### **4.1. Overview of Vulnerabilities and Disproportionate Impacts**

For various reasons, developing countries are particularly vulnerable to climate change. Their economies are typically reliant on climate-sensitive industries like agriculture and fishing. Limited financial resources limit their ability to adapt, and poor infrastructure increases their vulnerability to climatic disasters (Adger et al., 2003). Furthermore, many poor nations are located in places particularly vulnerable to climate change's effects, such as tropical zones, low-lying coastal areas, and drought-prone areas

### **4.2. Case Studies**

*i. Sea-level Rise and Small Island Developing States (SIDS):* SIDS, which include Pacific, Caribbean, and Indian Ocean nations, suffer existential concerns from sea-level rise. Because much of their land area and people are located along the shore, even a little sea-level rise can have disastrous consequences. Rising waves, for example, threaten the Maldives, which has an average ground height of 1.5 meters above sea level. The country has built sea barriers, installed water pumps, and even contemplated transferring its people (Karnauskas et al., 2018).

*ii. Desertification in Sub-Saharan Africa:* Sub-Saharan Africa deals with growing deserts, falling land fertility, and changing rainfall patterns. Droughts have been severe in the Sahel area, which borders the Sahara Desert, affecting local people who rely on pastoral and farming operations (Niang et al., 2014). Desertification not only endangers livelihoods but also exacerbates regional tensions over scarce resources.

*iii. Glacial Melt and Water Scarcity in the Andes:* The Andes Mountains, South America's most incredible mountain range, are undergoing fast glacial melt. Countries such as Bolivia and Peru, which rely on meltwaters for drinking, agriculture, and electricity (hydropower), are on the verge of a water crisis. The retreat of Bolivia's Chacaltaya glacier, previously a skiing destination, exemplifies this concerning trend (Rangecroft et al., 2016).

### **4.3. Economic Consequences: GDP, Agriculture, and Trade Disruptions**

Climate change has the potential to stifle developing-country economic progress, worsening poverty. Agricultural yields, for example, are expected to diminish owing to irregular rainfall, resulting in higher food costs and food insecurity (Schlenker & Lobell, 2010). Natural catastrophes caused by climate change may wreak havoc on infrastructure, lowering GDP. Developing countries frequently lack sufficient insurance coverage, resulting in massive economic losses. Furthermore, disruptions in one area might have repercussions in others. For example, a drop in agricultural production might impact trade balances, raising import costs and putting pressure on limited foreign exchange reserves.

#### **4.4.Social Consequences: Migration, Health, and Food Security**

The social consequences of climate change are numerous and diverse:

*Migration:* Environmental variables, exacerbated by climate change, can lead to both internal and transnational migration. For example, significant displacement has occurred in Africa's Lake Chad Basin due to drought, desertification, and violence (Warner, 2010).

*Health:* Warmer temperatures can aggravate vector-borne illnesses such as malaria and dengue. Malnutrition caused by decreased agricultural output combined with contaminated water sources can result in a slew of health problems, particularly for children (McMichael et al., 2006).

*Food Security:* Because agriculture is a primary source of income in many developing nations, low yields can lead to higher food costs, reducing food accessibility and contributing to malnourishment and civil discontent (Barrett, 2013). Finally, the effects of climate change on developing countries are far-reaching, affecting every part of life, from the economy to health. The global community's reaction must be broad, recognizing these nations' specific vulnerabilities and giving the required financial, technical, and logistical support to secure a resilient future.

### **5. ECONOMIC REPERCUSSIONS OF PARIS AGREEMENT IMPLEMENTATION**

The Paris Agreement, signed in 2015, was a watershed event in the global response to climate change. While the agreement offers a road to a more sustainable future, its implementation has several economic ramifications, particularly for poorer countries. Understanding these economic consequences is crucial for developing strategies that maximize favorable results while mitigating problems. Climate change profoundly affects people's lives around the world. Taking precautions against climate change and adapting to this change will only be possible by transitioning to a sustainable and low-carbon economy. In this situation, significant economic investments and coordinated actions become increasingly necessary. The Paris Climate Agreement appears as one of these cooperation initiatives. Considering that the global economy continues to be primarily dependent on oil, gas, and coal, countries have made adhering to the Paris Agreement more than a matter of choice by reducing annual greenhouse gas emissions and following a long-term path to complete decarbonization.

#### **5.1.The Cost of Mitigation and Adaptation for Developing Nations**

The twin challenge for emerging countries is to seek socioeconomic progress while satisfying their Paris Agreement obligations. Both mitigation (lowering greenhouse gas emissions) and adaptation (adapting to the effects of climate change) have costs:

*Mitigation:* Transitioning from fossil-fuel-based energy sources to greener alternatives sometimes necessitates large initial capital investments. Furthermore, nations that rely on fossil fuel exports may see lower earnings in a global low-carbon economy (Jakob et al., 2016).

*Adaptation:* Building flood barriers, modifying agricultural techniques, or moving susceptible areas all require significant costs to adapt to shifting climate trends. The UNEP

forecasts that poor nations' adaptation costs might range from 140 to 300 billion USD per year by 2030 (UNEP, 2016).

### **5.2. The Green Climate Fund (GCF) and Financing Mechanisms**

Recognizing the financial problems, particularly for poor countries, the Paris Agreement highlights the importance of financial assistance from industrialized countries.

*GCF:* The GCF, which was established in 2010, intends to provide major financial resources to developing nations to aid in mitigation and adaptation efforts. The fund's objective is to raise \$100 billion year by 2020, with funds coming from both the public and commercial sectors in industrialized countries (Amighini et al., 2022).

*Financing Mechanisms:* Beyond the GCF, the Agreement highlights various funding options, ranging from direct government-to-government assistance and multilateral lending by organizations such as the World Bank to novel structures such as climate bonds and carbon credit systems (Hailes, 2011).

### **5.3. Potential Economic Opportunities: Green Jobs, Sustainable Infrastructure, and Renewable Energy Industries**

While the Paris Agreement creates economic obstacles, it also creates significant opportunities:

*Green Jobs:* As countries migrate to greener economies, new job possibilities in renewable energy, energy efficiency, and green transportation emerge. In 2018, for example, the renewable energy sector employed approximately 11 million people worldwide, with the majority working in poor countries (IRENA, 2019).

*Sustainable Infrastructure:* Investing in sustainable infrastructure, such as efficient public transportation systems and resilient urban projects, can spur long-term economic advantages while lowering emissions (Bhattacharya et al., 2016).

*Renewable Energy Industries:* Developing countries, many of which have abundant solar and wind resources, can bypass fossil fuel-based systems by tapping into the fast-developing renewable energy market and supporting technical innovation and industrial growth (Jacobson et al., 2017).

### **5.4. Challenges in Accessing Finance and Technology Transfers for Low-Income Countries**

Despite the potential, numerous impediments prevent low-income countries from effectively implementing the Paris Agreement:

*Access to Finance:* While funds such as the GCF exist, obtaining them may be time-consuming and bureaucratic, requiring significant documentation and project proposals, which can be intimidating for governments with little institutional capacity (Betzold & Weiler, 2017).

*Technology Transfer:* Access to innovative green technology, crucial for mitigation and adaptation, must be improved by intellectual property rights and prohibitively expensive costs. While frameworks such as the UNFCCC's Technology Mechanism attempt to enable technology transfer, actual hurdles continue (Ockwell et al., 2008).

*Debt Vulnerabilities:* Many emerging countries are heavily in debt. Allocating resources to climate action while servicing debt can pressure national budgets, highlighting the need for debt relief efforts connected to climate action (Lusardi et al., 2018).

While the Paris Agreement's implementation brings economic obstacles, particularly for developing countries, it also provides a rare chance to support long-term prosperity. It will be critical for a resilient and prosperous future to embrace this revolutionary potential while tackling the constraints.

## **6. CASE STUDIES: DEVELOPING COUNTRIES IN THE PARIS AGREEMENT ERA**

While the Paris Agreement establishes a global framework, it appears differently in different national situations. Developing countries, in particular, have the combined problem of development goals and climate obligations.

### **6.1.India: Striving for Renewable Transformation Amidst Developmental Challenges**

India, with a population of over a billion people, is at a crossroads between rising industrialisation and increasing climatic vulnerability. As the world's third-largest emitter, India's climate policies have worldwide ramifications (Dubash, 2019). Although there are no binding mitigation obligations under the Agreement, India has set a target of reducing its emissions intensity by 20-25% by 2020. Given its geographical location and the diversity of natural ecosystems, India is highly vulnerable to the adverse effects of climate change. India has introduced national laws, rules, plans, and policy instruments to address environmental issues. He supported this with his constitution. (Article, 48 A)

*Renewable Ambitions:* India has set lofty renewable energy ambitions, aiming for 450 GW of renewable energy generation by 2030. Initiatives such as the International Solar Alliance, based in India, demonstrate the country's commitment to solar energy (Dey et al., 2022).

*Developmental Challenges:* However, India's developmental imperatives frequently collide with these goals. Given its availability and energy security problems, coal, a substantial polluter, remains the backbone of India's energy matrix (Xu et al., 2015).

### **6.2.Kenya: Harnessing Geothermal Energy and the Dilemma of Fossil-Based Industrialization**

Kenya, in East Africa, is a fascinating example of renewable possibilities vs fossil fuel prospects. And also Kenya, one of the first African countries to ratify the Paris Climate Agreement, added that the country has implemented various institutional and policy measures to mitigate the effects of climate change. It has a wide variety of ecological regions and habitats, including lowland and montane forests, woodland and open grasslands, semi-arid shrublands, dry woodlands, inland waters and marine ecosystems.

*Geothermal Potential:* The East African Rift System, which runs across Kenya, has enormous geothermal energy potential. Olkaria, Kenya, is home to Africa's largest geothermal power facility, demonstrating the country's progress in harnessing this resource (Bertani, 2016).

*Fossil-based Industrialization:* Recent discoveries of oil reserves provide a conundrum. While they may provide an economic boost, there is a risk that they may lock the country into a carbon-intensive trajectory, thereby damaging its renewable successes (Johannes et al., 2015).

### **6.3. Brazil: Balancing Deforestation Concerns with Agricultural Aspirations**

Brazil has a substantial section of the Amazon rainforest, and is critical to global carbon sequestration.

*Deforestation Concerns:* Brazil has seen alarming deforestation rates fueled by logging, mining, and, most importantly, agriculture. The conversion of the Amazon rainforest into soybean fields and cow pastures has sparked global concern due to its ecological value and carbon storage capability (Fearnside, 2017).

*Agricultural Aspirations:* Agriculture is a significant economic engine in Brazil. Balancing global demand for commodities such as beef and soy with environmental protection is still a problematic policy task (Dos Reis et al., 2023).

### **6.4. Bangladesh: Frontline of Climate-induced Displacement and Resilience Efforts**

Bangladesh is one of the most susceptible countries to climate change due to its substantial deltaic territory.

*Climate-induced Displacement:* Rising sea levels, in combination with increased cyclonic activity, have resulted in recurring floods, leaving broad areas unusable and causing enormous internal displacements (Warner & Afifi, 2014).

*Resilience Efforts:* Despite these hurdles, Bangladesh has emerged as a pioneer in resilience. From constructing cyclone shelters and floating schools to encouraging climate-resilient agricultural methods, the country is adjusting to its changing environment in novel ways (Roberts & Huq, 2015).

Finally, these case studies shed light on the complex issues developed nations confront in the post-Paris Agreement age. The delicate balancing act of socioeconomic growth, resource restrictions, and climate obligations highlights the need for global collaboration, financial support, and technology transfer to ensure an equitable and inclusive climate-resilient future.

## **7. THE ROLE OF INTERNATIONAL AND REGIONAL PARTNERSHIPS**

No country is an island in the age of globalization, especially when it comes to addressing climate change, an issue that transcends political boundaries. International and regional collaboration is critical for accelerating effective responses, allowing resource sharing, and developing comprehensive solutions.

### **7.1.South-South Cooperation and Climate Solutions**

SSC has evolved as a strong channel for poor countries to interact and share information, technology, and resources. SSC, as opposed to traditional North-South cooperation, stresses reciprocal advantages and collective self-reliance among states of the Global South.

*Knowledge and Best Practice Sharing:* Because of similar issues and socioeconomic settings, emerging nations can provide more applicable ideas for their counterparts. For example, China's reforestation efforts can teach African countries dealing with desertification (Gray & Gills, 2016).

*Collaborative Climate Projects:* Joint ventures, such as the Africa-India renewable energy collaboration, use collective strengths and resources, magnifying benefits and stimulating technical innovation (Chaturvedi & Mulakala, 2016).

### **7.2.Bilateral and Multilateral Agreements Fostering Technology and Financial Support**

Bilateral and multilateral agreements both assume critical roles in climate action:

*Bilateral Agreements:* These are bilateral collaborations that frequently include technological transfers, financial assistance, or capacity-building initiatives. The United States-China Joint Announcement on Climate Change, for example, hastened both countries' pledges and spurred collaboration in renewable energy technologies (Lewis, 2015).

*Multilateral Agreements:* These frequently include numerous nations and arise from international bodies such as the UNFCCC. They combine resources and knowledge from several countries, amplifying their influence. The Kyoto Protocol's Clean Development Mechanism shows how such frameworks might support cross-national sustainable initiatives (Castro, 2012).

### **7.3.Role of International Organizations: World Bank, IMF, and Regional Development Banks**

International organizations serve as vital bridge builders, distributing resources and encouraging cooperation.

*World Bank:* The World Bank Group has emphasized climate action in its Climate Change Action Plan, including it in development programs. The World Bank's focus varies from climate-smart agriculture and resilient cities to renewable energy initiatives, providing nations with financial and technical help (World Bank, 2016).

*IMF:* Historically focused on monetary cooperation and financial stability, the International Monetary Fund has increasingly acknowledged climate change as a macro-critical issue. The IMF's interactions, particularly with developing countries, increasingly prioritize carbon pricing, the phase-out of fossil fuel subsidies, and the enhancement of climate resilience (Zenios, 2022).

*Regional Development Banks:* Localized solutions are provided by organizations such as the African Development Bank, Asian Development Bank, and Inter-American Development Bank, which are suited to their specific areas. These banks support infrastructure

projects, technological transfers, and capacity-building initiatives tailored to their respective areas' unique problems and opportunities (Qobo & Soko, 2015). Finally, international and regional collaborations are critical in the global climate debate. While each country has its own climate agenda, the interconnectedness of our planet needs joint action. These collaborations enhance impacts via common resources, expertise, and objectives, promising a coordinated and successful response to the climate problem.

## **8. FUTURE PROJECTIONS AND POLICY RECOMMENDATIONS**

As we enter the third decade of the twenty-first century, it is clear that climate change will remain a daunting problem, particularly for poor nations. Their inherent weaknesses, along with their socioeconomic goals, need a proactive response.

### **8.1. Anticipated Challenges for Developing Countries in the 2030s and 2040s**

*Increasing Climate Extremes:* Extreme weather phenomena, ranging from heatwaves to cyclones, are expected to become more frequent and intense as global temperatures rise. Developing countries, particularly those in Asia and Africa, are projected to be badly impacted, putting pressure on their resources and infrastructure (IPCC, 2018).

*Sea-level Rise and Coastal Vulnerabilities:* Low-lying areas suffer existential concerns, particularly in Bangladesh, Vietnam, and tiny island nations, with saltwater intrusion hurting agriculture and displacements becoming a recurring issue (Nicholls & Cazenave, 2010).

*Economic Strains:* Many emerging countries' economic growth prospects may be compromised. Climate-sensitive industries such as agriculture and fisheries may face severe disruptions, resulting in employment losses and food insecurity (Ahmed et al., 2019).

### **8.2. Strategies for Enhancing Resilience and Adaptive Capacities**

*Integrated Climate-Development Policies:* Climate issues must be integrated into countries' more extensive development plans. This includes assuring climate-resilient infrastructure developments, urban planning, and economic policies (Bowen et al., 2020).

*Capacity Building and Knowledge Sharing:* From meteorological agencies to urban planners, improving institutional capacity is critical. Regional platforms can help with information sharing, best practices dissemination, and innovation (Huq & Toulmin, 2006).

*Investment in Research and Technologies:* Developing nations must prioritize climate science research and invest in solutions that address their unique issues, such as early warning systems and climate-resilient crops (Lemos et al., 2012).

### **8.3. Recommendations for Equitable Growth and Sustainable Development Pathways**

*Promote Green Industries:* Developing countries have a rare chance to skip carbon-intensive stages of growth. Investments in renewable energy, sustainable agriculture, and green transportation can help create jobs while also fitting with the Paris Agreement aims (Hallegatte et al., 2016).